

Coastal Surface Temperatures from ECOSTRESS

ECOSTRESS Science and Applications Team Meeting - November 16, 2022

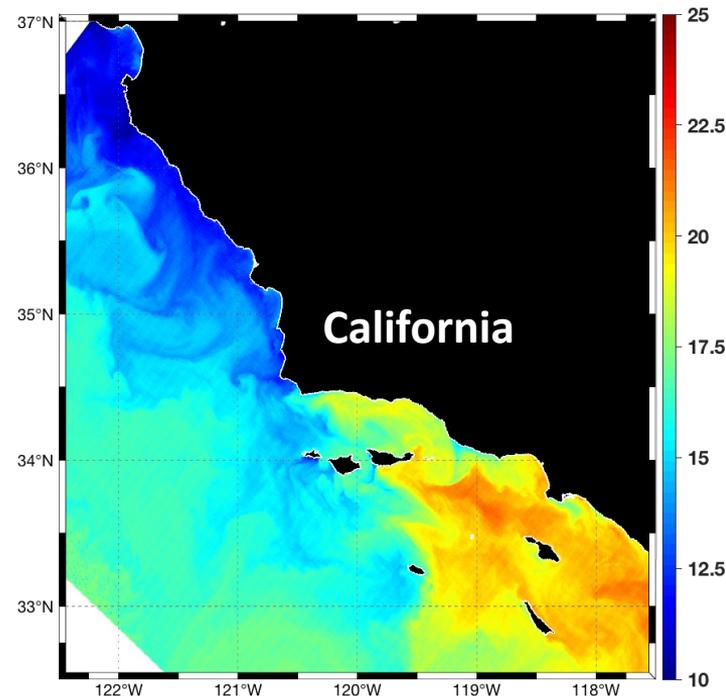
Dan Otis (PI)

Frank Muller-Karger (Co-I)

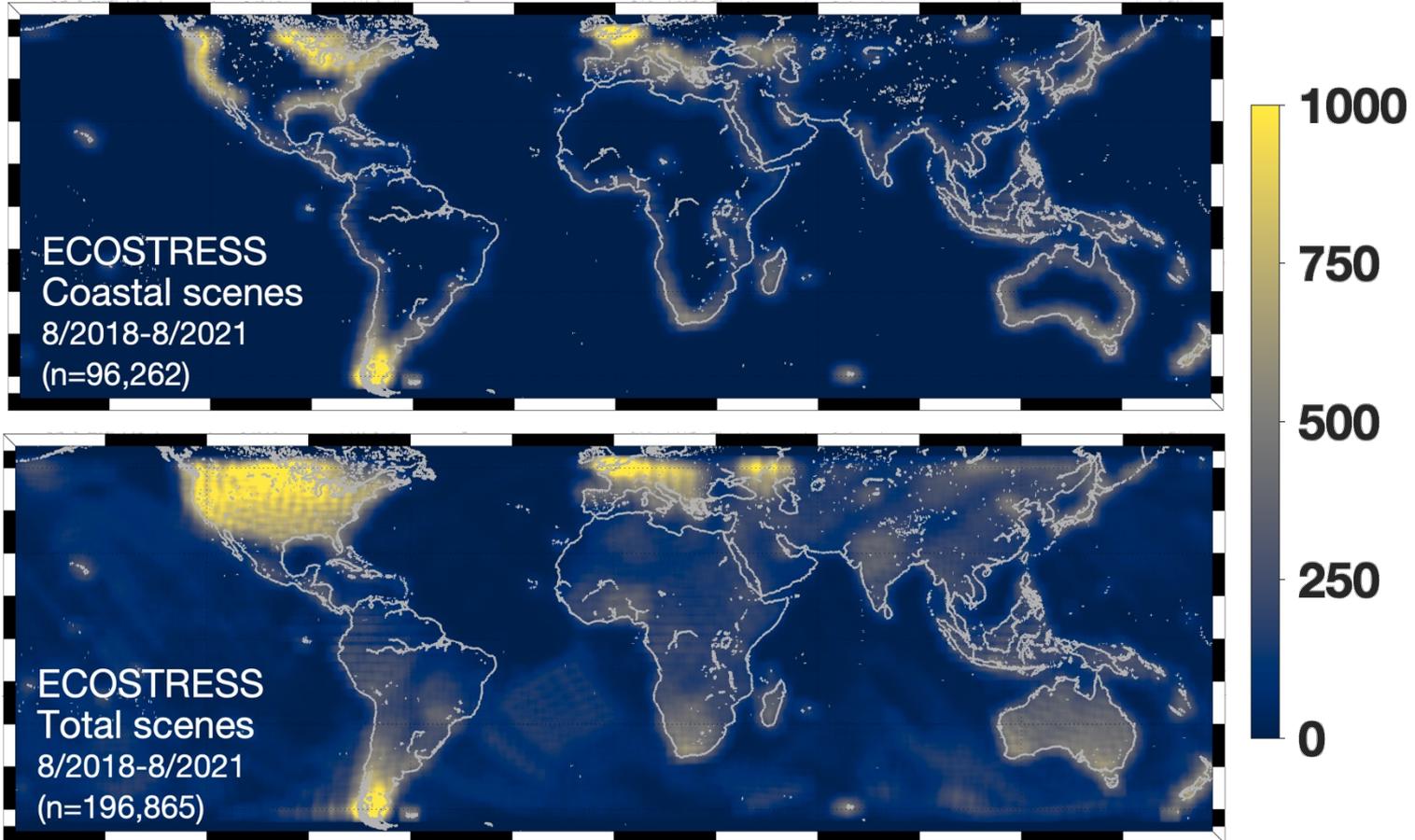
University of South Florida, College of Marine Science

Glynn Hulley (Collaborator)

NASA JPL

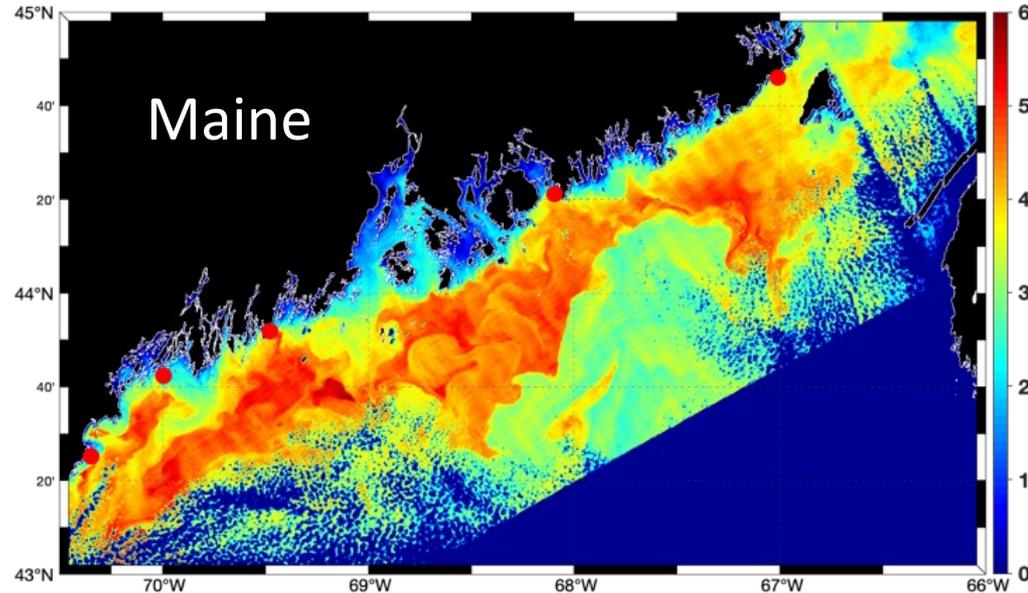
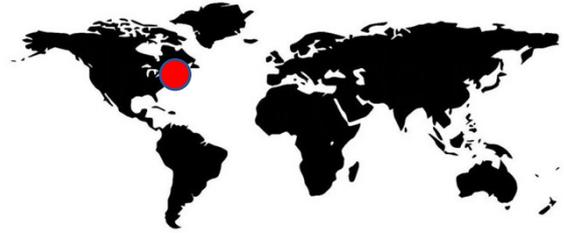


Where does ECOSTRESS sample?



Motivation to use ECOSTRESS over water

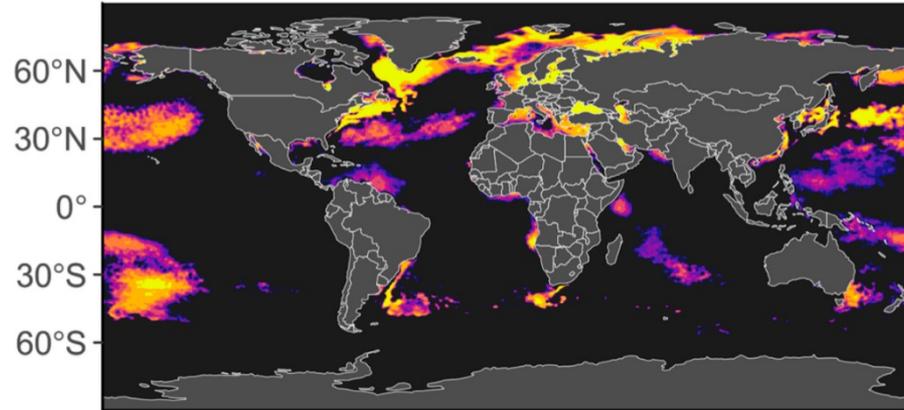
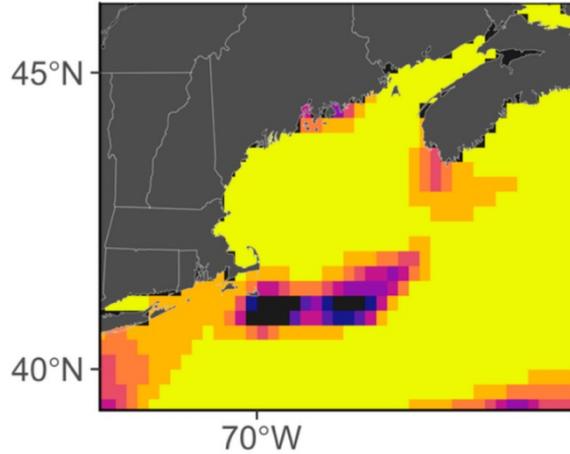
- High spatial resolution
- Non-uniform overpass times
- Ability to extract data up to and across the water-land interface



Composite of two ECOSTRESS scenes
Gulf of Maine - January 14, 2019

Gulf of Maine

Earth's Fastest Warming Ocean Regions



Warming Rate Percentile: 1982-2021

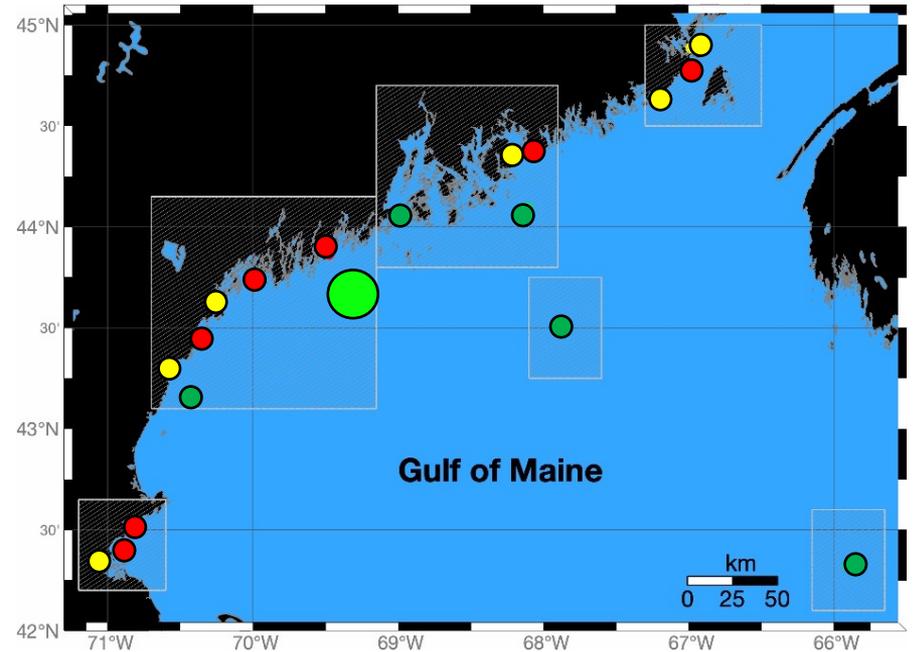
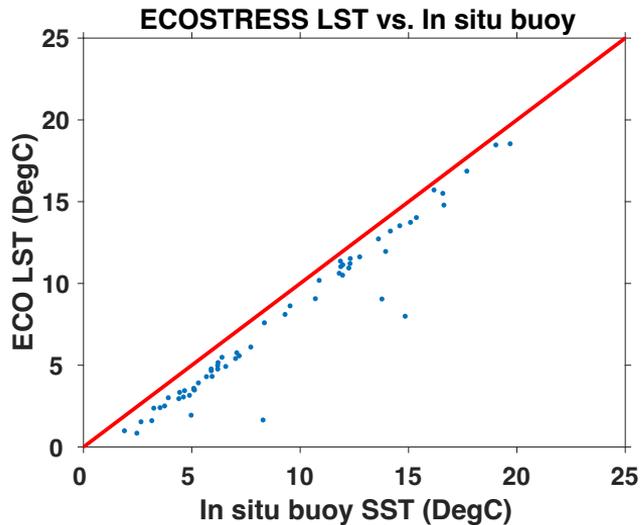


0.825 0.8500 0.8750 0.9000 0.9250 0.9500 0.975

Data Source: OISSTv2, rankings below 80th percentile masked.

Gulf of Maine:

- NERACOOS Buoys
- NOS Water Level/Temp. stations
- Biomimetic loggers



ECOSTRESS scene footprints are hatched in white.

ECOSST Split-Window SST algorithm

$$SST = a_0 + a_1 T_{B4} + a_2(T_{B4} - T_{B5}) + a_3(T_{B4} - T_{B5})(1 - \sec(\theta))$$

a_0 , a_1 , a_2 and a_3 coefficients for ECOSTRESS determined as in Hulley et al. (2011)

T_{B4} = ECOSTRESS Band 4 brightness temperature (10.6 micron)

T_{B5} = ECOSTRESS Band 5 brightness temperature (12 micron)

θ = Sensor view angle

Satellite matchups between MODIS and ECOSTRESS

Image pairs w/time offset < 3h hours

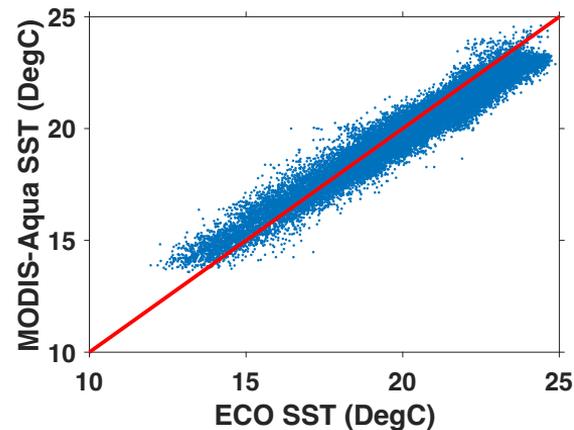
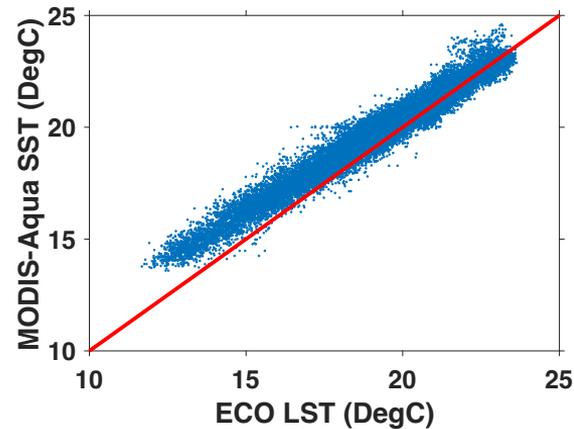
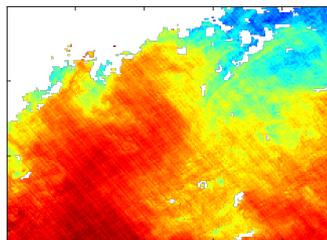
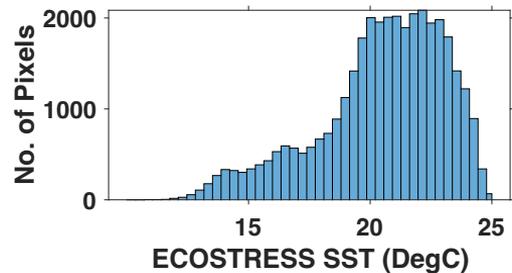
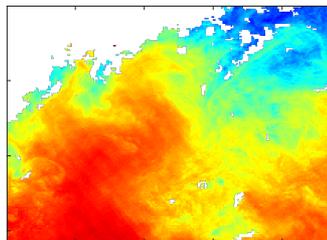
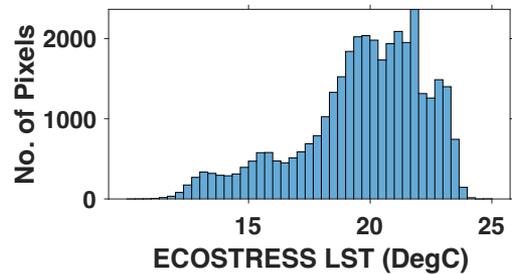
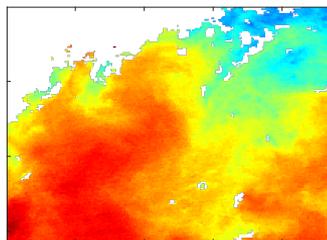
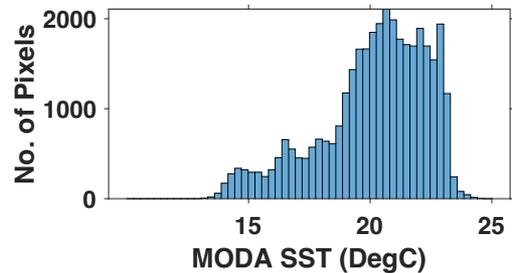
37 daytime, 23 nighttime

- MODIS Aqua 1-km SST (day) and SST4 (night) - from OBDAAC
- ECOSTRESS full scenes from Earthdata Search

ECOSTRESS data aggregated to MODA 1-km grid to allow direct comparison

Clouds masked based on ECOSTRESS V2 Cloud Mask and MODIS SST Quality flag

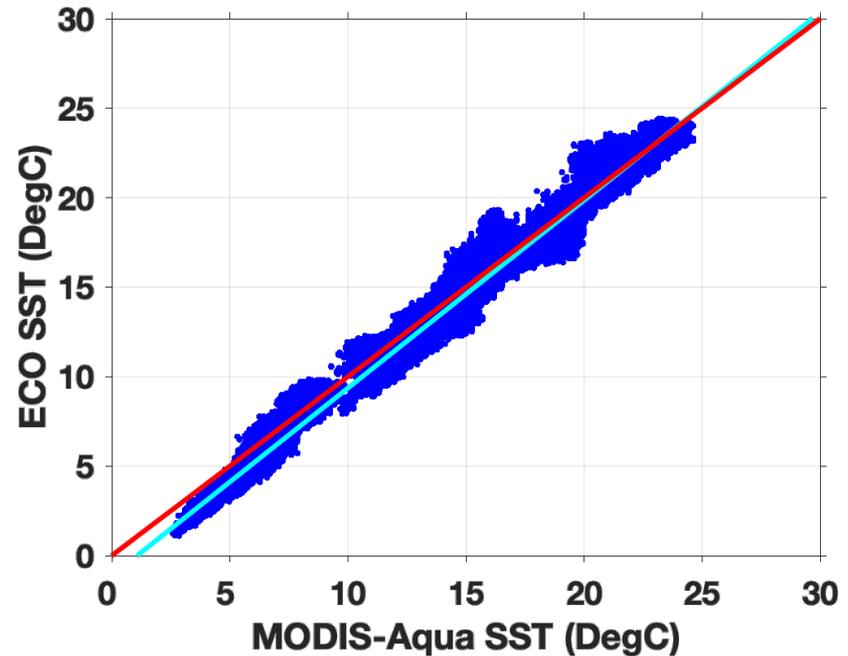
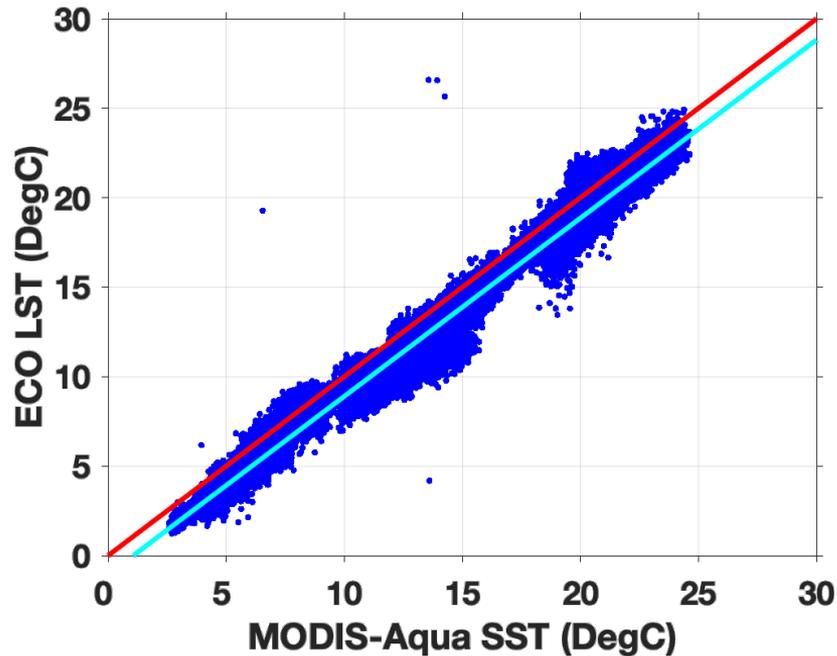
02 AUG 1950 GMT



MODIS and ECOSTRESS daytime SST comparisons

37 daytime image pairs; ~258,000 pixels

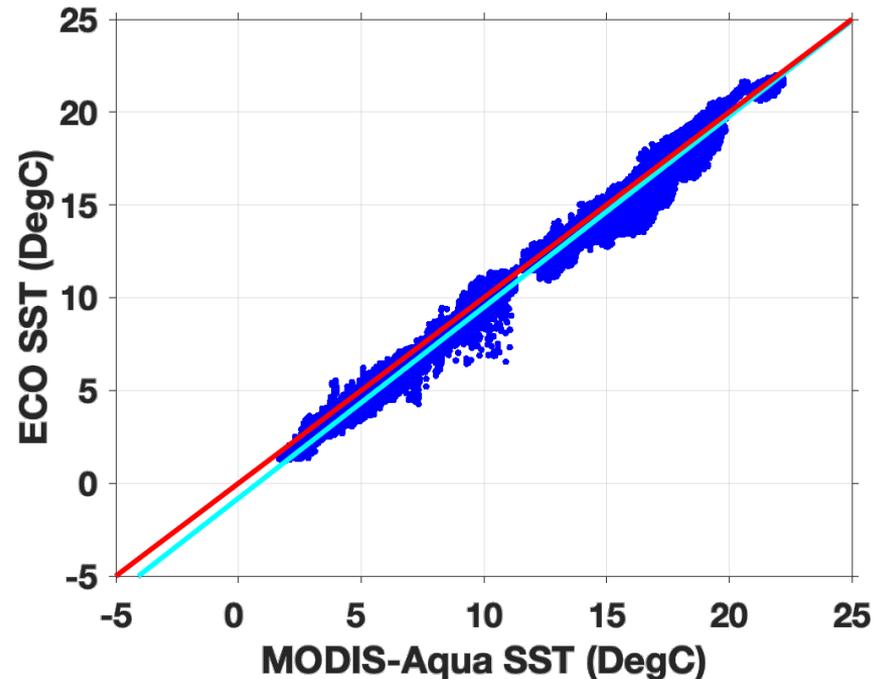
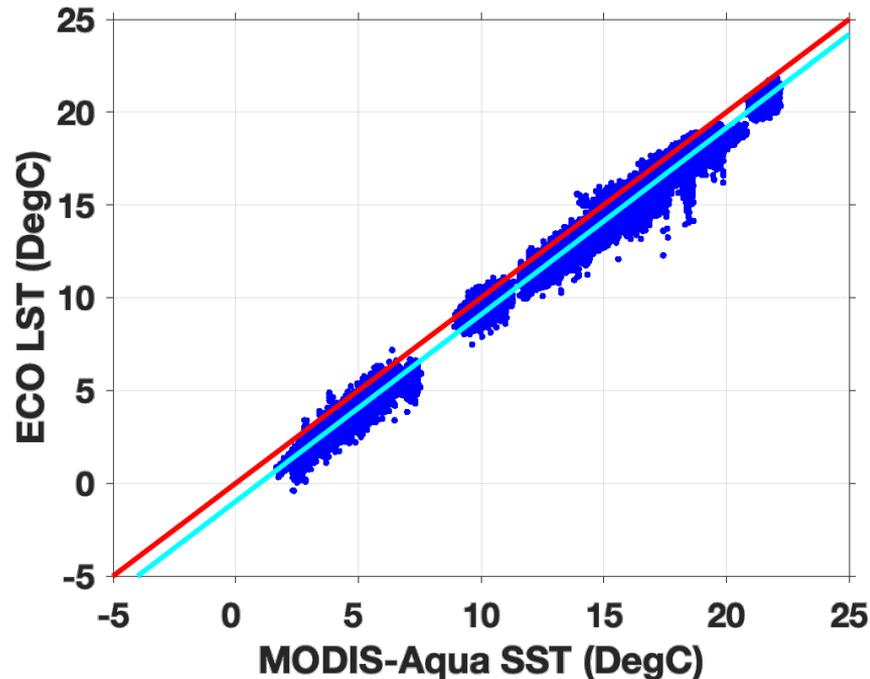
Red = 1:1 ; Lt. Blue = Best fit



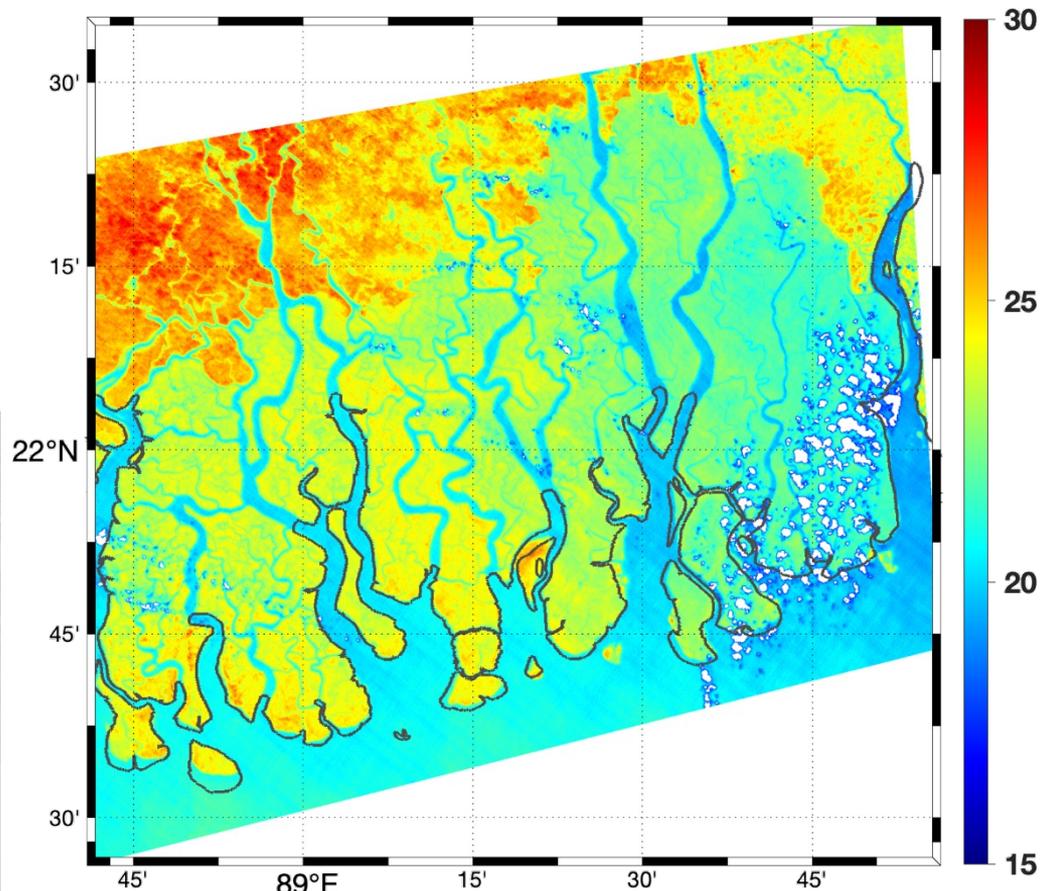
MODIS and ECOSTRESS nighttime SST comparisons

23 nighttime image pairs; ~506,000 pixels

Red = 1:1 ; Lt. Blue = Best fit



Sundarbans

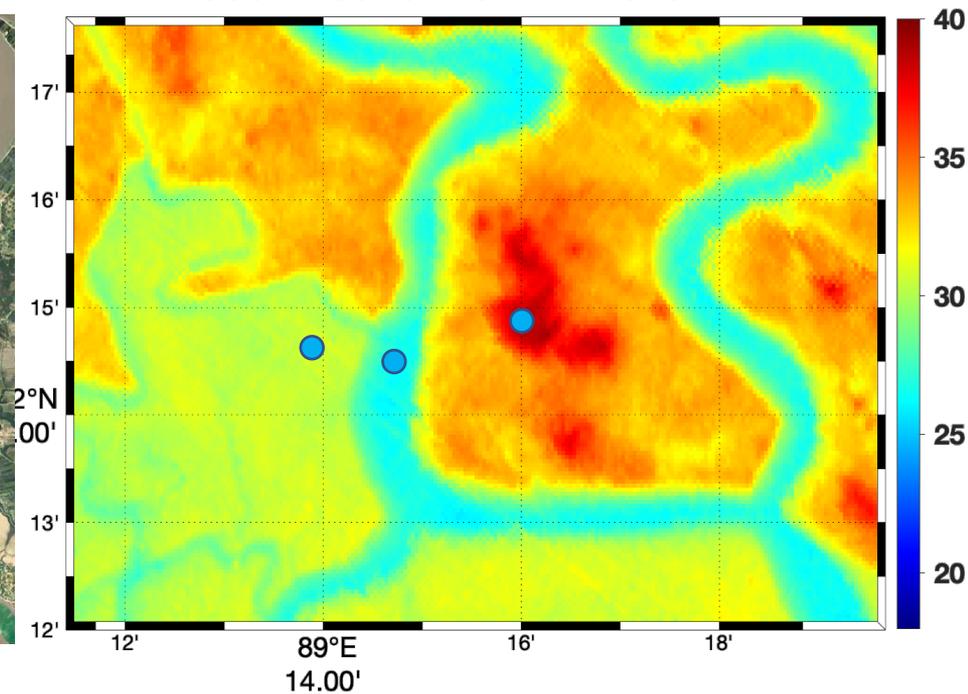


ECOSTRESS LST 31 JAN 2020

Site	Min	Max	Range
Mangrove	14.8	32.4	17.6
Deforested	12.9	41.8	28.9
River	19.2	31.2	12.0



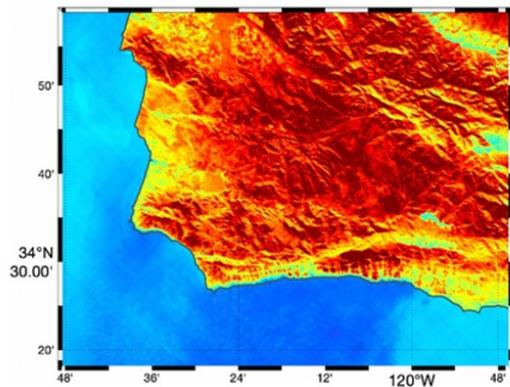
ECOSTRESS LST 26 MAR 2020



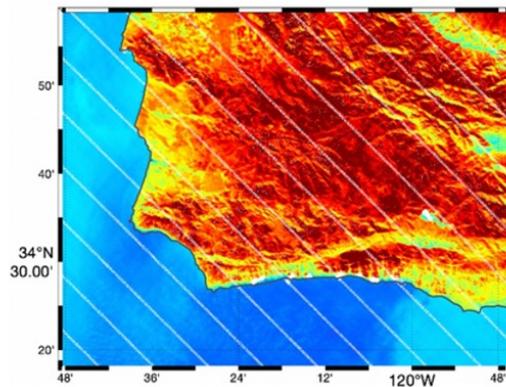
Cloud Filter v2 Example



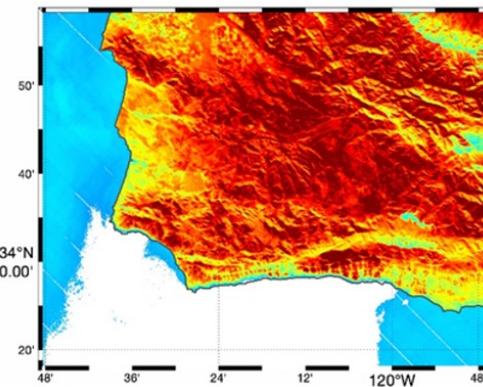
LST - 30 Nov 2021



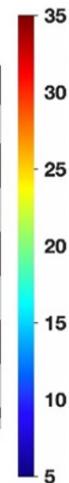
No mask



V1 mask



V2 mask



Questions?

Contact email: dotis@usf.edu

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